CLAIMS:

1. A composite comprising a silicon based substrate, an environmental barrier coating (EBC) with a top layer, wherein the top layer comprises a velocity barrier layer.

2. A composite according to claim 1, wherein the velocity barrier layer reduces the velocity of an impinging gas stream by at least 50% across the thickness of the velocity barrier layer.

3. A composite according to claim 1, wherein the velocity barrier layer reduces the velocity of an impinging gas stream to less than 1 meter per second across the thickness of the velocity barrier layer.

4. A composite according to claim 1, wherein the substrate is selected from the group consisting of silicon nitride, silicon carbide, silicon aluminum oxynitride, silicon nitride composite, silicon carbide composite, silicon carbon nitride, molybdenum alloy containing silicon, niobium alloy containing silicon, iron alloy containing silicon, nickel alloy containing silicon, cobalt alloy containing silicon, and mixtures thereof.

5. A composite according to claim 1, wherein the EBC comprises a protective layer comprising of silicon, refractory oxides, refractory oxide silicates, refractory oxide aluminosilicates, rare earth oxides, rare earth silicates, rare earth aluminosilicates, alkaline earth oxides, alkaline earth silicates, alkaline earth aluminosilicates, yttria, yttrium silicate, yttrium aluminosilicate, barium aluminosilicate, strontium aluminosilicate, barium-strontium aluminosilicate, and oxides and silidices of molybdenum, silicon, tantalum, niobium, zirconium, hafnium, aluminum, titanium, and mixtures thereof.

6. A composite according to claim 1, wherein the velocity barrier layer comprises a ceramic layer having a porosity in the range of 1 to 50% by volume.

7. A composite according to claim 1, wherein the velocity barrier layer comprises a ceramic layer having a porosity in the range of 10 to 35% by volume.

8. A composite according to claim 1, wherein the velocity barrier layer has a thickness and a thermal resistance such that the ratio of velocity barrier layer thickness to overall coating thickness is within ± 25% of the ratio of velocity barrier layer thermal resistance to the overall coating thermal resistance.

9. A composite according to claim 8, wherein the velocity barrier layer reduces the velocity of an impinging gas stream to less than 1 meter per second across the thickness of the velocity barrier layer.

10. A composite according to any one of claims 1-9, wherein the velocity barrier layer comprises a ceramic selected from the group consisting of alumina, alumina and mullite, zirconia, hafnia, tantala, niobia, yttria, silica, alkaline earth oxides, refractory metal oxides, rare earth oxides, and mixtures thereof.

11. A composite according to any one of claims 1-9, wherein the velocity barrier layer comprises a ceramic selected from the group consisting of porous hafnia, porous mullite, porous alumina, porous alumina plus mullite where the mullite is present in the range of 50 to 99% by weight, porous yttria, porous yttrium silicate ranging from 1:1 to 1:2 mole ratio of yttria and silica, porous zirconia, porous yttria stabilized zirconia where the yttria is present in the range of 1 to 20% by weight, porous niobia, porous niobia plus alumina where the alumina is present in the range of 20 to 80% by weight and mixtures thereof.

12. A composite silicon based substrate, an environmental barrier coating (EBC) with velocity barrier layer:

wherein the substrate comprises silicon nitride, silicon carbide, silicon aluminum oxynitride, silicon nitride composite, silicon carbide composite, silicon carbon nitride, molybdenum alloy containing silicon, niobium alloy containing silicon, iron alloy containing silicon, nickel alloy containing silicon, cobalt alloy containing silicon, and mixtures and compounds thereof;

wherein the environmental barrier coating comprises one or more protective layer selected from the group consisting of silicon, refractory oxides, refractory oxide silicates, refractory oxide aluminosilicates, rare earth oxides, rare earth silicates, rare earth aluminosilicates, alkaline earth oxides, alkaline earth silicates, alkaline earth aluminosilicates, yttria, yttrium silicate, yttrium aluminosilicate, barium aluminosilicate, strontium

aluminosilicate, barium strontium aluminosilicate, and oxides and silicides of silicon, molybdenum, tantalum, niobium, titanium, zirconium, hafnium, aluminum, titanium, and mixtures thereof;

and wherein the velocity barrier layer is selected from the group consisting of a ceramic comprising alumina, alumina and mullite, titania, zirconia, hafnia, tantalum oxide, niobium oxide, yttria, silica, alkaline earth oxides, refractory metal oxides, rare earth oxides, and mixtures thereof.

13. A composite according to claim 12, wherein the velocity barrier layer reduces the velocity of an impinging gas stream by at least 50% across the thickness of the velocity barrier layer.

14. A composite according to claim 12, wherein the velocity barrier layer reduces the velocity of an impinging gas stream to less than 1 meter per second across the thickness of the velocity barrier layer.

15. A composite according to claim 12, wherein the velocity barrier layer has a thickness and a thermal resistance such that the ratio of velocity barrier layer thickness to overall coating thickness is within $\pm$ 25% of the ratio of velocity barrier layer thermal resistance to the overall coating thermal resistance.

16. A composite according to claim 12, wherein the velocity barrier layer comprises a ceramic layer having a porosity in the range of 1 to 50% by volume.

17. A composite according to claim 12, wherein the velocity barrier layer comprises a ceramic selected from the group consisting of porous hafnia, porous mullite, porous alumina, porous alumina plus mullite where the mullite is present in the range of 50 to 99% by weight, porous yttria, porous yttrium silicate ranging from 1:1 to 1:2 mole ratio of yttria and silica, porous zirconia, porous yttria stabilized zirconia where the yttria is present in the range of 1 to 20% by weight, porous niobia, porous niobia plus alumina where the alumina is present in the range of 20 to 80% by weight and mixtures thereof.

18. A turbine component formed from the composite of claim 1 or 12.